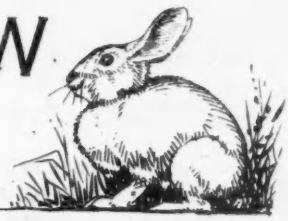
WILDLIFE REVIEW



AN ABSTRACTING SERVICE FOR WILDLIFE MANAGEMENT
ISSUED FOR THE INFORMATION OF COOPERATORS
BY THE FISH AND WILDLIFE SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

FINISHED

CONTENTS

	Page
Abstracts:	
Bibliography	2
Classification	2
Conservation	3
Control	4
Cycles	5
Destruction	5
Diseases and parasites:	
Acanthocephala	6
Bacterial diseases of birds	6
Bird malaria	7
Bird vectors	7
Botulism	7
Dutch elm disease	8
Eelgrass	8
Nematoda, Onchocerca	8
Pseudotuberculosis	8
Ecology	9
Education	12
Food habits:	
Bird enemies of grasshoppers	16
Mouse damage	16
Nutrition; vitamins	16
Seed destruction	17
Utilization of:	
Mormon cricket	17
Osage orange	17
Of antelope	17
Bob-white	17
Chipmunk	18
Goshawk	18
Hawks and owls	18
Owl, Burrowing	19
Wild turkey	19
Introductions	19
Life histories	21

	Page
Abstracts--Continued	
Management:	
Aquatic plants	27
Cottontail	28
Duck, Wood	28
Electric fence in	29
Farmer-sportsman relationship	29
Forest wildlife	30
Fur animals	31
Goose, Canada	31
Harvesting pheasants	32
Muskrat in relation to waterfowl	32
Planting willows	32
Private shooting preserves	32
Range appraisal	33
Refuges, Federal	33
Refuges, Waterfowl	34
Restoration	34
Salting	34
Seed harvesting and storage	35
Seed treatment	35
On small farms	35
Soil conservation in relation to wildlife conservation	36
Stocking, turkey	37
On stripped areas	37
Waterfowl	37
Winter feeding	37
Natural history	38
Predation	38
Propagation	39
Research	39
U. S. Government	40
Wildlife leaflet	41
Notes and news	42
Author index for this issue	44

Washington, D. C. No. 30 March, 1941

Bibliography: Conservation education

Anderson, Ellen L., and Effie G. Bathurst. Good references for conservation education in secondary schools, U. S. Office of Education (Federal Security Agency, Washington, D. C.), Bibliography No. 55, 14 pp. (3 x 8-3/8), 1938.

References to: Basic materials for instruction, as to factual background and methods of teaching; and sources of supplementary materials, including visual and auditory aids, and bulletins and periodicals.

Bibliography: Conservation education

Bathurst, Effie G., and Ellen L. Anderson. Good references for conservation education in elementary schools, U. S. Office of Education (Federal Security Agency, Washington, D. C.), Bibliography No. 70, 14 pp. (3 x 8-3/8), 1938.

Contents organized under the same heads as those of the preceding entry.

Bibliography: Conservation education

Bathurst, Effie G., and Ellen L. Anderson. Good references on conservation of birds, animals, and wild flowers for use in elementary schools, U. S. Office of Education (Federal Security Agency, Washington, D. C.), Bibliography No. 72, 9 pp. (3 x 8-3/8), 1938.

Materials for children are classed as noted in the title; a later section refers to materials for teachers.

Others of the Bibliography series that may be of use in our field are Nos: 32, Visual aids in education: Motion pictures; 33, Visual aids in education: Lantern slides, film strips, etc.; and 34, Pictures, maps, charts, etc.

Classification: Bighorns

Cowan, Ian McTaggart. Distribution and variation in the native sheep of North America, American Midland Naturalist (Notre Dame, Ind. $1.00 a copy), 24(3), Nov. 1940, pp. 505-580, 4 pls., 1 map, 24 tables.

Besides fully discussing its special subject, the nature and extent of variation in the bighorns, this outstanding paper is a revision of the American species. Synonomy with exhaustive references is a feature. Location and full data for the type of each form are given, as well as statements of range, measurements, weights, and descriptive and comparative notes. Two species with ten races are recognized, of which one is apparently extinct. Bibliography of 6 pages.

Conservation: Aims

Gabrielson, Ira N. Planning for wildlife restoration, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 12-19.

Abstracted from the Maryland Conservationist in WILDLIFE REVIEW, No. 28, August 1940, p. 3.

Conservation: Game

Bennett, Logan J. Recuperating Americans, American Forests (919 Seventeenth St., Washington, D. C. 35 cents a copy), 47(1), Jan. 1941, pp. 10-12, 48, 2 photos, 1 graph.

Review of former and present statuses of several game species. The same set of facts create pessimism in some minds, optimism in others. This author is of the latter persuasion. The implication that Migratory Bird Hunting Stamp funds have been of dominating importance in recent acquisition of lands for Federal refuge purposes is incorrect. Through the fiscal years 1935-39 they amounted to about 10 percent of the total funds available, and have been used more for development than for acquisition of refuge areas.

Conservation: Hawks and owls

Fox, Adrian C. Our friends--the hawks and owls, Dakota Farmer (Aberdeen, S. Dak.), Dec. 28, 1940, p. 508, 1 photo.

Popular article to the effect that there are "good" hawks as well as "bad", urging a more considerate view of the group and protection of the more beneficial kinds.

Conservation: Nature reserves

Shelford, V. E. List of reserves that may serve as nature sanctuaries of national and international importance, in Canada, the United States, and Mexico, Ecology (Prince & Lemon Sts., Lancaster, Pa. $1.50 a copy), 22(1), Jan. 1941, pp. 100-110, 2 maps.

This paper, which urges the setting aside of areas extensive enough to preserve their natural features, including the large mammals, contains discussions of predatory animals and their control, and of buffer zones to protect existing reservations from change. The main body of the article consists of suggestions relating to 81 areas in Canada and the United States that it is desirable to preserve in natural condition. An annotated list of present and proposed similar areas in Mexico also is given.

Control: Bird damage

Kalmbach, E. R., and Johnson A. Neff. Bird control: A statement of Federal policies with a suggested method of approach, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 195-199.

Reference is made to a statement of policies published in 1932, and the point emphasized that no marked change in them is proposed. This paper sketches the procedure in investigation of reported damage and in demonstration of any relief measures found necessary. Both defensive and aggressive methods are mentioned and the desirability of avoiding damage by modification of agricultural practice is pointed out. Approach must be impartial; real grievances against birds must be honestly met; and necessary control must be carried out safely, economically, legally, and in a manner acceptable to public opinion. The practicability of alteration of farm practice requires close attention to each individual case but also a broad program of cooperation and research participated in by all parties at interest.

Control: Fish-eating birds

Pough, Richard H. The fish-eating bird problem at the fish hatcheries of the Northeast, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 203-206.

As a result of field observation and correspondence, thirty kinds of birds were definitely implicated in damage at hatcheries and a dozen or so additional were found to be under suspicion. The belted kingfisher, great blue heron, black-crowned night-heron, and osprey were the subjects of most frequent complaint. At only about a dozen out of 260 establishments was screening installed that was adequate to exclude all fish-eating birds. All others relied on killing the birds, usually in disregard of law. In nine States, about 5,000 kingfishers, and 1,000 great blue, and 1,300 night, herons had been killed in a year. There is good evidence that the "controlled" species are decreasing in numbers. The author believes that excluding measures are completely feasible, and that they can be adopted at an ultimate profit to the fish culturist and always at a profit to the public.

Control: Prickly pear

Rumley, Francis. Control of prickly pear in Australia, Science (Lancaster, Pa. 15 cents a copy), 92(2397), Dec. 6, 1940, pp. 528-529.

Review of an official report. The most effective method of control has been introduction of insects that feed upon cactus. Prickly-pear infestation has been reduced 75 to 95 percent of what it was in 1925. The great bulk of former prickly-pear territory is now reclaimed and it is believed will never revert to its previous useless state.

Control: Rabbit, European

Middleton, A. D. The control and extermination of wild rabbits, Bureau of Animal Population, Oxford University (Oxford, England), 27 pp., 3 figs., Sept. 1940.

The usual unorganized efforts at control are unsatisfactory because they rarely reduce the animals below a level from which they can recover in a single season. Moreover it is usually postponed so late that much damage is done that could be prevented if the rabbits were killed down in early fall. Where rabbits are numerous, their market value will compensate for part or even the whole cost of control. The various methods of combatting the animals are mentioned, and of them, trapping and cyanide gassing are recommended. Both of these and other methods are fully described.

Cycles

Hatfield, Donald M. Animal populations and sunspot cycles, Chicago Naturalist (Chicago Academy of Sciences, Chicago, Ill.), 3(4), Dec. 1940, pp. 105-110, 1 fig.

Review of recent literature (6 titles cited), mention of species known to exhibit cyclic fluctuations, and discussion of theories on the subject. The answer to the question, "What causes cycles?" rests upon future investigations.

Cycles: Arctic animals

Chitty, Dennis. Canadian Arctic wild life enquiry, 1938-39, Journ. Animal Ecology (Cambridge University Press, 200 Euston Road, N. W. 1, London, England. 20 shillings a copy), 9(2), Nov. 1940, pp. 227-242, 4 figs., tables.

Fourth annual report on this inquiry into fluctuations of lemmings, arctic foxes, and snowy owls, and into diseases of sledge dogs. The methods employed are described and the results tabulated and mapped. This report notes that: lemmings have decreased nearly everywhere in the Eastern Arctic; arctic foxes declined sharply in the same region after two years of fairly general increase, in the West fox populations increased; snowy owls decreased except in northern Labrador and north-west of Hudson Bay.

Destruction: By arsenical baits

Lilly, John H. The effect of arsenical grasshopper poisons upon pheasants, Journ. Economic Entomology (E. N. Cory, College Park, Md. 75 cents a copy), 33(3), June 1940, pp. 501-505, 1 fig., 2 tables.

Review of literature (4 titles cited) and report upon experimental feedings of poisoned baits and of grasshoppers dead or dying from eating such baits. The details of the experiments, changes in weight of the birds, and results of chemical analyses of two of the experimental birds are tabulated. Author's

summary: "Young pheasants in nature are apparently not menaced directly by arsenical baits as they are commonly recommended and used. Not only are the baits spread too thinly to make them readily available but even the better ones are decidedly unpalatable to these birds. Caged pheasants consumed grasshoppers dead and dying as a result of eating arsenical baits almost as readily as they did unpoisoned grasshoppers, and there are no indications that they will not do so in nature. A young pheasant that had eaten comparatively large quantities of the U. S. D. A. standard bait and another one fed exclusively on poisoned grasshoppers for a period of 12 days showed no gross pathological symptoms when autopsied, and neither of them retained significant quantities of arsenic in the body tissues subsequently analyzed. The results presented here indicate that grasshopper poisoning campaigns are not an important menace to young ringneck pheasant or to individuals [persons] who may eventually consume birds so exposed."

Destruction: Crippling losses

Nelson, Urban C., and Gustav Swanson. Losses of crippled game birds, Conservation Volunteer (Minnesota Dept. of Conservation, St. Paul), 1(6), March 1941, pp. 44-48, 2 tables.

Losses of ducks varying from 11 to 54 percent, and of pheasants, from 6 to 48 percent, are discussed according to types of shooting and experience of hunters. The value of dogs in reducing such losses is distinctly indicated. Suggestions are made as to hunter action to improve the situation.

Diseases and Parasites: Acanthocephala

Van Cleave, Harley J. Relationships of the Acanthocephala, American Naturalist (Science Press, Lancaster, Pa. $1.00 a copy), 75(756), Jan.-Feb. 1941, pp. 31-47.

History of study of the group, discussion of characters and relationships. Author's summary: "In conclusion, a review of the evidence gives ample proof that the Acanthocephala have little in common with the Nematoda. The grouping of Acanthocephala with any of the various aggregation of animals that have been proposed lacks convincing evidence of natural grouping based on common origin. Only with the Cestoda are impelling evidences of relationship traceable, but these are of a degree denoting long separation. It seems clear that recognition of Acanthocephala as an independent phylum best measures the extent of isolation of this group. In allocating this phylum it should be placed immediately adjacent to the Plathelminthes in recognition of the many points held in common by Acanthocephala and Cestoda." Bibliography of 19 titles.

Diseases and Parasites: Bacterial diseases of birds

Carpenter, Cliff D., Chairman. Poultry diseases, Journ. Amer. Vet. Med. Assoc. (600 S. Michigan Ave., Chicago, Ill. 75 cents a copy), 97(764), Nov. 1940, pp. 510-526.

This report, devoted to bacterial diseases, includes their names in various languages, the scientific appellations of the causative organisms, and of the bird hosts, both vernacular and scientific names being given for wild species. Index numbers refer to the published articles dealing with the various diseases (30 in number) which are listed in a bibliography of 189 titles.

Diseases and Parasites: Bird malaria

Hewitt, Redginal. Bird malaria (The Johns Hopkins Press, Baltimore, Md. $1.10 a copy), xvii+228 pp., 15 pls., 33 figs., 22 tables, 1940.

Surprisingly, more than 500 titles bearing on bird malaria are cited; they are provided with a classified index, and their contents, of course, assimilated in the text, which seems complete and satisfactory in every respect. Avian malaria occurs in all parts of the world and has been identified in some 170 species which are listed. Incidence, as revealed by blood smears, averaged 5.8 percent in nearly 7,000 individual birds. Thirty-one nominal species of Plasmodium from birds are listed and a key given for identification of 14 of the better understood forms. The book treats also the discovery and history of bird malaria, experimental hosts and methods, characteristics of laboratory infections, symptomatology and pathology, immune reactions, effects of drugs on infections, mosquito transmission, and stages in the life cycle of the parasites.

Diseases and Parasites: Bird vectors

Clapham, Phyllis A. On wild birds as transmitters of helminth parasites to domestic stock, Journ. Helminthology (Institute of Agricultural Parasitology, St. Albans, England. 7 shillings 6 pence a copy), 18(1), March 1940, pp. 39-44.

Review of literature (5 titles cited). Starlings probably play a part in transmitting gapeworms, not directly, but by infecting intermediate hosts. The author made a study of the relation of wild birds to several helminth parasites of poultry and reports the rook and starling as probable transmitting agents.

Diseases and Parasites: Botulism

Fried, Louis A. Duck sickness in Minnesota, Conservation Volunteer, (Minnesota Dept. of Conservation, St. Paul), 1(5), Feb. 1941, pp. 48-51.

Brief history of the disease in more western states and of previous studies in Minnesota. Report on recent outbreaks in that State, in particular one in Grant County in 1940. Green algae were excessively abundant and in decaying masses of them the botulinus toxin was determined. 580 dead and sick birds were found and of 119 affected individuals collected, only 14 responded to treatment and survived. Fifteen species were represented. The frightening devices used to scare birds away from the lakes are described; they were very effective. 98 percent of the birds examined were birds of the year.

Diseases and Parasites: Dutch elm disease

Brewer, E. G. The fight for the elms, American Forests (919 Seventeenth St., Washington, D. C. 35 cents a copy), 47(1), Jan. 1941, pp. 22-25, 4 maps, 1 table.

This disease has been known in this country for 11 years and has been identified in about 61,000 trees. Incidence seems to be decreasing and hope for eradication of the malady is not unreasonable provided the control campaign undergoes no relaxation.

Diseases and Parasites: Eelgrass

Cottam, Clarence. The eelgrass situation, Fall 1940, Plant Disease Reporter (U. S. Bureau of Plant Industry, Washington, D. C.), 25(2), Feb. 1941, pp. 46-52 (mimeographed).

General notes on the plant, its utility to wildlife and to man, and past periods of scarcity, with a report summarizing conditions as observed during the past two years. In general, improvement has been most marked in waters of lower salinities. The plant is perhaps only 10 percent as abundant as it was before the present period of depletion. Details are given for several sections of the Atlantic Coast.

Diseases and Parasites: Nematoda, Onchocerca

De Nio, Reginald M., and Raymond H. Best. The foot-worm disease in deer of the northern Rocky Mountain region, U. S. Forest Service Region One (Missoula, Mont.) Field Notes on Wildlife, 2(6), Feb. 1941, 4 pp., 1 pl., 1 map.

Onchocerca flexuosa which causes lesions in the feet of white-tailed and mule deers (rarely elk) was found in 79 out 424 (18.63 percent) animals; the highest rate of occurrence was in male adults (43 out of 62). The parasite is most abundant where the deer are most crowded.

Diseases and Parasites: Pseudotuberculosis

Beaudette, F. R. A case of pseudotuberculosis in a blackbird, Journ. Amer. Vet. Med. Assoc. (600 S. Michigan Ave., Chicago, Ill. 75 cents a copy), 97(761), Aug. 1940, pp. 151-157.

Review of literature (28 titles cited) on occurrence of this disease in birds of other countries and report of what is thought to be the first definite record for the United States. Brunswick, N. J. Symptoms, lesions, results of laboratory cultures.

Ecology: Beaver-trout relationship

Rasmussen, D. I. Beaver-trout relationship in the Rocky Mountain region, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 256-263, 2 figs., 3 tables.

Eastern studies are reviewed and the probability suggested that their findings are not applicable to the very different environment of Utah. A large-scale investigation was made in the Wasatch National Forest, covering nearly 600 miles of streams occupied by beavers. The area contained 380 active colonies, 1,505 dams, 1,143 ponds, and an estimated population of 1,976 of the animals. Comprehensive studies made of practically all conditions affecting trouts are reported in some detail. They revealed very few factors that might be adverse; the most harmful one was obstruction of movements of the fishes by the beaver dams.

Ecology: Biologic balance

McAtee, W. L. Biologic balance on the farm, Smithsonian Report 1939 (1941) (Supt. of Documents, Washington, D. C. $1.50 a copy), pp. 319-323, 2 pls.

An essay on the interdependences of organisms based on everyday happenings on farms. The opposed tendencies of expanding ranges but maintaining territories are discussed as factors in bringing biologic balance. Man often ruthlessly disturbs the balance but will find it to his advantage to work, so far as circumstances permit, with, rather than in opposition to, nature.

This is a revision of an article of the same title in Soil Conservation, 5(4), October 1939, pp. 97-99, that was not called to attention at the time because of unapproved editorial changes.

Ecology: Bird distribution

Pitelka, Frank A. Distribution of birds in relation to major biotic communities, Amer. Midland Naturalist (Notre Dame, Ind. $1.00 a copy), 25(1), Jan. 1941, pp. 113-137, 11 figs. (maps).

Discussion of the life-zone concept and of criticisms of it. Biomes, or floral-faunal communities, are defined and mapped, and the correlation with them of the ranges of 27 species of birds reported. The distribution of birds is affected by life forms of plants and is modified by successional phenomena. Bibliography of 46 titles.

Ecology: Drainage operations

Bourn, Warren S. Wildlife management on land ditched for agriculture, Trans. Fifth N. A. Wildlife Conference, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 296-300.

This article gives statistics indicating the extent of drainage and notes that about a twelfth of the land under organized drainage is in districts that have become inactive or that have been abandoned for agricultural purposes. Unorganized drainage doubtless has been no more successful and the whole movement has resulted in much unnecessary destruction of wildlife habitat. Various types of damage are specified. The Biological Survey by obtaining the right to review proposals for drainage involving expenditure of Federal funds was enabled to check unwise drainage. Some projects have been disapproved and others approved with provisos safeguarding the interests of wildlife.

Ecology: Fire

Maissurow, D. K. The role of fire in the perpetuation of virgin forests of northern Wisconsin, Journ. Forestry (Mills Bldg., 17th St. & Pennsylvania Ave., N. W., Washington, D. C. 50 cents a copy), 39(2), Feb. 1941, pp. 201-207, 2 tables.

Methods of the study, and the findings for mixed hardwoods and the hemlock-hardwood type, are described. Within the past 5 centuries fires have burned through 95 percent of the virgin forest of Wisconsin. Such fires are to be regarded as "periodic and ecologically normal events in the life of the forest." "Fires have been necessary factors or agents in the perpetuation of a number of species x x x thus determining the form and composition of the forest." "Practically all 'virgin' stands are really successfully rehabilitated areas [that have been] burned over." "Although fire may be looked upon, from the silvicultural point of view, as a factor inimical to the normal development of the forest, it has been and is, from a broad ecological viewpoint, a normal, beneficial and necessary factor in the perpetuation of virgin forests."

Ecology: Of groups of birds and mammals

Taylor, Walter P. Ecological classification of the mammals and birds of Walker County, Texas, and some adjoining areas, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 170-176.

Author's summary: "An ecological classification was attempted of the 49 mammals and the 171 birds of Walker County, in eastern Texas. Each species is listed but once, so the classification is somewhat arbitrary because of overlapping functions. Allowances being made for this method of classification, there are among the mammals one seed eater, two house followers, three soil workers, four flesh-eaters or regulators, six insect-eaters, seven buffer species (serving as food for fur animals, game, and regulators), seven domestic animals, nine fur animals, and ten game species. The birds include one species sometimes injurious to trees, three omnivores of variable ecologic reference, fourteen water birds, seventeen flesh-eaters, eighteen song birds (mostly fruit, seed, grain, and insect eaters), twenty conspicuously insectivorous forms, twenty-five seed- and insect-consuming species, twenty-five game birds, and forty-eight tree protectors. Most of the non-game species are

ecologically interrelated with the game animals, either as predators, prey, food, competitors, or otherwise; indeed, there is probably not a single species of bird or mammal that possesses no ecological connection with some of the game species. In a majority of cases the relation is probably insignificant, but in a substantial proportion it is important. In order to provide for effective game management we must know as much as possible about the non-game species as well as about the game forms. Then, also, many of the non-game birds and mammals are of substantial interest and value in their own right."

Ecology: Land-use in relation to wildlife

Dambach, Charles A. The effect of land-use adjustments on wildlife populations in the Ohio Valley region, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 331-337, 1 fig., 2 tables.

Wildlife populations are largely controlled by land-use. Effects produced by the adoption of certain soil-conservation practices in the region specified are reported. Shift in acreage from corn and small grains to meadow may result in material increase in the population of farm breeding small birds. (See abstract of his paper with E. E. Good in WILDLIFE REVIEW, No. 26, Feb. 1940, pp. 30-31.) On the other hand the pheasant is adversely affected by such a change. The number of small birds is practically in direct proportion to the amount of field border cover, hence farm practices that reduce this type of shelter depress the bird population. Allowing fields to return to brush, at first greatly encourages rabbits and small birds. Breeding bird populations are notably greater in ungrazed, than in grazed, woodland. In the latter, ground- and shrub-nesting species are almost wholly excluded. Adoption of soil conservation practices in some cases has increased farm bird populations up to 58 percent. Bibliography of 9 titles.

Ecology: Pheasant

Bennitt, Rudolf, and Harold V. Terrill. Possible temperature factors in north central pheasant distribution, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 428-432.

Circumstantial evidence supporting a working hypothesis: That one reason for the failure of pheasants to establish themselves naturally in large numbers south of a line, which very closely follows the boundary between Thornthwaite's micro- and meso-thermal provinces, is high egg temperatures resulting in the death of embryos. Available evidence is presented and the suggestion made that related ecological factors be made the subject of research. Bibliography of 7 titles.

Ecology: Population, fluctuations

Lindeborg, Robert G. Fluctuations in the abundance of small mammals in east-central Illinois, 1936-1939, Ecology (Prince & Lemon Sts., Lancaster, Pa. $1.50 a copy), 22(1), Jan. 1941, pp. 96-99, 1 fig. 1 table.

Description of the area and of the methods of the study and of variations in the numbers of small mammals that are further depicted in both table and graph. Author's summary: "The wood-mouse and shrew populations were high in the Trelease Woods near Urbana, Illinois, in the fall of 1934, low in 1935 and 1936; showed partial recovery in 1937; and reached 'peak' abundance in 1938. The relative abundance of food furnished by seed-bearing trees may be a factor in these fluctuations in the numbers of small mammals, but other unknown factors also must be involved."

Ecology: Range surveys

Hasel, A. A. Estimation of vegetation-type areas by linear measurement, Journ. Forestry (Mills Bldg., Washington, D. C. 50 cents a copy), 39(1), Jan. 1941, pp. 34-40, 1 fig., 4 tables.

"Maps are very useful in providing a picture of the location of vegetation types, but mapping as a method for determining type areas may be inadequate." "When ground surveys are used, a promising alternative to mapping is to estimate vegetation-type areas by application of the linear-measurement method, by which distances through each type are measured along parallel survey lines. These linear measurements are converted to an area basis by using a factor which depends upon the spacing of lines, and the result is taken as an estimate of area in the type." The method is discussed and illustrated by graphs and tabulations and its mathematics demonstrated.

Ecology: Range surveys

Pechanec, Joseph F. Sampling error in range surveys of sagebrush-grass vegetation, Journ. Forestry (Mills Bldg., Washington, D. C. 50 cents a copy), 39(1), Jan. 1941, pp. 52-54, 1 table.

"One major objective of a range survey is to determine the forage cover, as a basis on which to estimate grazing capacity. However, it is extremely unlikely that the estimated forage yield of an area will coincide with the actual yield, even if methods of measuring vegetation are without error, and if individual members of survey crews are mechanical in their precision. If sampling units are drawn correctly, however, an estimate of the magnitude of the difference between the estimated and actual yield and the likelihood of the occurrence of such difference is provided by the unbiased estimate of sampling error. An unbiased or representative estimate of sampling error also provides appropriate information for estimating the number of sampling units (plots) needed to attain arbitrary limits of accuracy in future surveys on similar range areas." The author recommends strictly random sampling and greater rather than lesser intensity of sampling.

Education

Anon. Suggested unit material prepared to show how pupil experiences in conservation of renewable natural resources may be provided in the second year of the core curriculum of secondary schools, Virginia Commission of Game and Inland Fisheries [et al] (Blacksburg, Va.), 21 pp. (mimeographed), Sept. 1940.

Directions for organizing a pupil experience unit are given in detail in chart form. The treatment as to conserving wildlife begins on page 10 and includes: Exploration, orientation, planning, development, and summarizing, and a bibliography of 15 titles.

Education: Conservation

Bathurst, Effie G. Conservation excursions, U. S. Office of Education Bul. 1939, No. 13 (Supt. of Documents, Washington, D. C. 15 cents a copy), v+106 pp., illus., 1940.

The purposes and uses of excursions are outlined, preparations for them both by teacher and class suggested, and sampling journeys and follow-up activities discussed. Wildlife is given due prominence in the text, in a tabulation of instructional methods, and in a 5-1/2 page bibliography.

Education: Conservation

Bathurst, Effie G. Teaching conservation in elementary schools, U. S. Office of Education, Bul. 1938, No. 14 (Supt. of Documents, Washington, D. C. 20 cents a copy), v+125 pp., illus., 1940.

"The purpose of this bulletin is to aid teachers in the selection, adaptation, and organization of materials for the teaching of conservation in grades 1 to 7 or 8." It is especially devoted to teaching methods, seems largely concerned with soil conservation, and treats wildlife rather incidentally.

Education: Conservation

Bathurst, Effie G. Curriculum content in conservation for elementary schools, U. S. Office of Education, Bul. 1939, No. 14 (Supt. of Documents, Washington, D. C. 15 cents a copy), v+79 pp., illus., 1940.

"The purpose of this bulletin is to suggest educative values of conservation in their relation to curriculum content in such a way that the teacher can quickly consider them in her plans for teaching and better help her pupils to participate in conservation enterprises of worth to the community." Wildlife teaching (pp. 25-34) is typified by a section on birds under the following headings: Understandings to be developed, participation in conservation activities, and attitudes and continuing interests. Animals are briefly mentioned elsewhere and the terminal bibliography includes 20 entries relating to birds.

Education: Conservation

Cook, Katherine M., and Florence E. Reynolds. Opportunities for the preparation of teachers in conservation education, U. S. Office of Education, Pamphlet No. 90 (Supt. of Documents, Washington, D. C. 5 cents a copy), 13 pp., 1940.

"Courses concerned with the conservation of our natural resources and designed for teachers in elementary and secondary schools are available in at least 138 institutions of higher learning located in 35 different States." In 5 States--Arkansas, Florida, Oklahoma, Tennessee, and Wisconsin--the teaching of conservation in the public schools is required by law. Data regarding courses in conservation education are summarized, and also tabulated in detail by States and institutions. Descriptions of representative courses are given, as well as a supplementary list of institutions offering specialized education in this field.

Education: Conservation

Gabrielson, Ira N. Wildlife conservation (The Macmillan Co., New York, N. Y. $3.50 a copy), xv+250 pp., 32 pls., 23 figs., 1941.

Biological interchange and the interdependence of conservation programs are discussed in the first seven chapters of this book; the others are entitled: Some basic facts in wildlife conservation, resident game, migratory birds, fur animals, nongame birds and mammals, rare and vanishing species, predator relationships, wildlife refuges and their place in conservation, and surmounting the obstacles to conservation. "Three concepts are considered to form the basis of the conservation movement: (1) That soil, water, forest, and wildlife conservation are only parts of one inseparable program; (2) that wildlife must have an environment suited to its needs if it is to survive; and (3) that any use that is made of any living resource must be limited to not more than the annual increase." Without some of the appurtenances of a text-book, this work was prepared for use in the secondary schools, for which purpose as well as for adult reading it should be valuable.

Education: Conservation

Palmer, E. Laurence. Waterways in spring, Cornell Rural School Leaflet (Cornell University, Ithaca, N. Y.), 33(4), March 1940, 32 pp., 2 figs., 13 cartoons, 6 tables.

General information on ponds, lakes, streams, marshes, and bogs; and discussion of their vertebrate life. The mammals treated are the muskrat, mink, otter, and raccoon. The value of their furs in New York is tabulated for the years 1927 and 1936. The muskrat crops in Maryland and Louisiana are cited for comparison. The take of the fur species mentioned is summarized by States for 1937 and the production per square mile of the three more common kinds, calculated. Returns from furs are widely distributed and this asset should be carefully preserved.

The birds treated are waterfowl, the take of which in New York is tabulated for 7 years in the period, 1921-1936. There are chapters also on salamanders and frogs, and snakes and turtles. Conservation for economic values is the keynote of the publication.

Education: Conservation

Renner, George T., and Wm. H. Hartley. Conservation and citizenship (D. C. Heath & Co., Boston, Mass. $1.52 a copy), x+367 pp., 118 illus., 1940.

A text-book, by two professors and prefaced by a third, in which the aims are stated: "(1) To learn how our country's resources have been used and how they have been misused; (2) to examine the steps which have been taken toward a better use of our resources; (3) to find out what meanings and ideas are involved in the present use of the term conservation." Conservation is planned use; all types are considered. Chapter 6 (pp. 185-215) is entitled "Our vanishing wildlife." Its aims are: "(1) To consider general changes in animal and plant life brought about by man; (2) to note examples of wildlife destruction in order to understand the seriousness of the problem as a whole; (3) to determine the steps which can be taken toward restoring wildlife and preventing further depletion."

Section headings indicating the nature of the treatment are: Disappearing wildlife, wildlife in early America, the American bison, the American parakeet, market hunting, fur trapping, industrial development and wildlife, economic value of wildlife, conservation and restoration. Practical exercises and activities are suggested in connection with each chapter and there is a sectionalized bibliography. The part on wildlife includes 16 titles. Another appendix lists sources of motion pictures pertaining to all departments of the book.

Education: Conservation in geography teaching

Bennitt, Rudolf. Wildlife conservation and geography, Journ. Geogr. (A. J. Nystrom & Co., 3333 Elston Ave., Chicago, Ill. 35 cents a copy), 39(6), Sept. 1940, pp. 217-225.

Comment on treatment of wildlife in geographic texts; it is chiefly economic and deals little with management and harvesting. Man's activities have decreased some species and increased others so that wildlife as a whole is different from what it was. Management may be guided so as to favor the more desirable animals, and teaching should stress the status of wildlife as a renewable natural resource. Harvesting is justifiable so far as management replaces the quota taken. The customary approaches to wildlife maintenance are discussed under the headings of: Restrictive laws, artificial restocking, and refuges. Suggestions are given as to the handling of conservation teaching in the schools.

Education: Ornithology notebook

Allen, Arthur A. Ornithology laboratory notebook (Comstock Publishing Co., Ithaca, N. Y. $3.00 a copy), 4 Ed. 1941, 204 pp., 1 col. map (life zones), many figs.

This edition has been modified so as to apply less exclusively to northeastern birds and has the subtitle: "For recording observations made in the field and studies made in the laboratory on the birds of North America." It contains directions for study of skins and skeletons, an illustrated key to the orders of N. A. birds, and another to the nests of the commoner northeastern species, condensed statements of the summer and winter ranges of N. A. birds with migration data for central New York, and 188 outline drawings for filling in with colors. There are in addition many schedules for recording information about birds studied and making lists of those seen.

Food Habits: Bird enemies of grasshoppers

Neff, Johnson A., and C. C. Wilson. The influence of birds on local grasshopper outbreaks in California, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 189-195, 2 tables.

Notes on previous studies of the bird enemies of grasshoppers, and on outbreaks of these insects in California, dating back to 1722. Recent infestations have done a million dollars damage annually. During one of these outbreaks, stomachs of 121 birds of 16 species were collected and examined; grasshopper remains were found in 80 of them, representing 11 species. Crows, yellow-billed magpies, Brewer's blackbirds, tricolored redwings, and meadowlarks made the best records as enemies of the insects. The results of the stomach analyses are given in two tables. These specially collected data are too few to warrant close estimates of the grasshopper destroying capacity of birds, but general field observations strongly indicate value in that respect. Bibliography of 5 titles.

Food Habits: Mouse damage

Isaac, Robert. Mice and conifers, American Forests (919 Seventeenth St., Washington, D. C. 35 cents a copy), 47(1), Jan. 1941, pp. 32-33, 5 photos.

Work of meadow and pine mice in plantations; all trees in some Connecticut nurseries were destroyed. Preferences of the mice are discussed and the damage described and illustrated. Reference is made to a means of control developed by the Fish and Wildlife Service to which organization inquirers are referred.

Food Habits: Nutrition; vitamins

Holmes, Arthur D., Francis Tripp, Frank G. Ashbrook, and Charles E. Kellogg. A study of Vitamin A in the nutrition of foxes, U. S. Dept. of the Interior, Wildlife Research Bul. 3 (Supt. of Documents, Washington, D. C. 5 cents a copy), 15 pp., 3 tables.

Noted here for the reference to wild foxes; analyses of 22 livers (from Conn., Mass., Md., N. Y.) revealed fat and vitamin A contents averaging materially higher than those for pen-raised animals.

Food Habits: Seed destruction

Anon. The animal factor in natural reproduction of jack pine, Lake States Forest Expt. Station (St. Paul, Minn.), Technical Notes 172, 1 p. (mimeographed), Jan. 1941.

Stomachs of 4 species of small rodents and 2 of sparrows were examined; jack pine seeds were found in 10 of 22 white-footed mice and in 3 of 8 chipping sparrows. Middens made by red squirrels feeding on the cones also were observed. Four-fifths of seeds exposed in low-sided screen baskets were consumed in 10 days. Planted seeds protected only by soil suffered 39 percent loss while those given special protection from birds and rodents lost 18 percent (germination failures plus insect damage).

Food Habits: Utilization of Mormon cricket

LaRivers, Ira. The Mormon cricket as food for birds, Condor (J. Lee Chambers, 2068 Escarpa Drive, Eagle Rock, Calif. 50 cents a copy), 43(1), Jan.-Feb. 1941, pp. 65-69.

Notes on 36 species of birds observed to feed on Anabrus simplex in Nevada in 1939.

Food Habits: Utilization of Osage orange

Wade, Douglas E. Osage orange and wildlife, Pennsylvania Game News (Pennsylvania Game Commission, Harrisburg. 10 cents a copy), 11(11), Feb. 1941, pp. 10, 32, 5 photos.

Review of literature (6 titles cited) and report on personal observations on use of the hedgeapples by rabbits, squirrels, pheasants, crows, and small birds. The apples averaged 14.5 ounces in weight. Suggestions are given as to seed treatment and as to the use of osage orange in wildlife management.

Food Habits: Of antelope

Rouse, Charles H. Notes on winter foraging habits of antelopes in Oklahoma, Journ. Mammalogy (Jn. B. Davis, College Station, Texas. $1.00 a copy), 22(1), Feb. 1941, pp. 57-60, 1 map.

Field observations on antelopes introduced to the Wichita Mountains Wildlife Refuge. Notes on 15 groups of plants eaten and the extent of their utilization. Shrublike perennials made up the greatest part of the forage. Brief notes on habits.

Food Habits: Of bob-white

Johnson, J. A. A study of bobwhite foods in relation to farm problems in northern Mississippi, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 337-343, 1 fig., 2 tables.

Author's summary: "(1) A total of 1,835 quail crops was saved by hunters from eleven contiguous counties in northern Mississippi during the hunting seasons of 1937-38, 1938-39, and 1939-40; (2) contents of the crops were analyzed and the data combined into county summaries by years; (3) the county summaries were combined each year because all had similar agricultural conditions; (4) a total of twenty-two items was found to constitute the bulk of foods during the three years; sixty-seven additional foods, exclusive of insects, were found in small quantities only; (5) the twenty-two species are given special consideration in connection with their adaptability to practices of crop production, pasture improvement, field border and gully control, wildlife areas, and woodland management which are needed for soil conservation on individual farms."

Four foods that constituted from 62 to 72 percent of the food in the 3 years were annual lespedezas, acorns, soybeans, and cowpeas.

Food Habits: Of chipmunk

Aldous, Shaler E. Food habits of chipmunks, Journ. Mammalogy (Wm. B. Davis, College Station, Texas. $1.00 a copy), 22(1), Feb. 1941, pp. 18-24, 1 table.

Report on food from 71 stomachs and 30 check pouches collected in Minnesota; the items are tabulated according to frequency of occurrence and are discussed in some detail. Orthoptera led among animal, and blueberries among vegetable, foods. The economic bearing of the chipmunk's feeding habits is considered. Bibliography of 6 titles.

Food Habits: Of goshawk

McDowell, Robert D. The eastern goshawk in Pennsylvania, Pennsylvania Game News (Pennsylvania Game Commission, Harrisburg. 10 cents a copy), 11(11), Feb. 1941, pp. 5, 31, 1 map, 2 photos, 3 tables.

Report upon 278 birds presented for bounty payment in 3 years during which there was no unusual influx. Sex and age classes and weights are summarized. Nearly three-fourths of the food consisted of game species (squirrels, rabbits, ruffed grouse) and poultry. The effectiveness of the bounty as a control measure is discussed.

Food Habits: Of hawks and owls

Bennitt, Rudolf. The Macon County hawk and owl investigation, Bluebird (Audubon Society of Missouri, Sullivan, Mo.), 8(2), Feb. 1941, pp. 9-10 (mimeographed).

Report on analysis of the stomach contents of birds killed in a county campaign against hawks and owls. The data are summarized by species and for the entire collection. Five species of hawks and four of owls were represented. The birds had not killed any appreciable number of game, poultry, or other birds. They had eaten mice chiefly and made an occasional meal on rab-

bits. The author believes that locally gathered evidence is necessary to convince people of the economic value of birds of prey.

Food Habits: Of owl, burrowing

Hamilton, W. J., Jr. A note on the food of the western burrowing owl, Condor (J. Lee Chambers, 2068 Escarpa Drive, Eagle Rock, Calif. 50 cents a copy), 43(1), Jan-Feb. 1941, p. 74.

Report on food remains collected at a prairie-dog colony in Denver, Colo.; crayfishes the most prominent food item.

Food Habits: Of wild turkey

Bennett, Logan J., and P. F. English. November foods of the wild turkey, Pennsylvania Game News (Pennsylvania Game Commission, Harrisburg. 10 cents a copy), 11(10), Jan. 1941, p. 8, 1 photo, 2 tables.

Report on the contents of 15 crops; vegetable matter 97.7 percent, the leading items being wheat, corn, and acorns; all food groups identified are listed.

Introductions: In Alaska

Murie, Olaus J. Wildlife introductions in Alaska, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 432-436.

Ordinarily introductions are attempted where wildlife has been depleted, and although Alaska hardly answers to that description, a good many introductions have been made. The author discusses those of the musk-ox, buffalo, black-tailed deer, Roosevelt elk, reindeer, blue fox, and ground squirrel. Probable success is indicated for some of these ventures and unfortunate results from others. "Such projects should rest not on mere wishful thinking or a desire merely to 'do something,' but on a real need, after careful study of requirements of the introduced species and of the resident species with which they will come into competition."

Introductions: Birds

Cooke, May T., and Phoebe Knappen. Some birds naturalized in North America, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 176-183.

List of 9 species, the importation of which is forbidden. Two of them, however, are widely established in the United States and two others near the border in British Columbia. Despite large annual importations, few species have been accidentally naturalized. The history and present status of 12 introduced species are recounted. They include the: mute swan, rock dove, Chinese spotted dove, ringed turtle dove, Australian crested dove, Mexican

comure, European skylark, European starling, crested myna, English sparrow, European tree sparrow, and European goldfinch.

Introductions: Game

Bump, Gardiner. The introduction and transplantation of game birds and mammals into the State of New York, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 409-420, 2 tables.

Since 1880, eighteen species of game mammals and twenty-one of birds have been imported, some of them in considerable numbers. Available information about these introductions is recorded in the tables. The proportion of success to failures is rather higher than is the average for such experiments. The author cites 9 points that should be taken into consideration when planning introductions in order still further to reduce the percentage of failures.

Introductions: Game

Ruhl, H. D. Game introductions in Michigan, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp.424-427.

The author recounts Michigan experience with the reindeer, moose, elk, pheasant, sharp-tailed grouse, Hungarian partridge, and capercaillie. The author's conclusions are: "(1) Where a choice exists, it usually is better to work with native rather than exotic species; (2) introductions should be made only after inventory of existing species and unoccupied range rather than on basis of successes elsewhere of exotics or the advice of pressure groups; (3) the value of introduction is far over-estimated by the public and by too many game administrators; (4) introductions usually have failed except (a) where changes in environment have depleted native stock so as to leave an unfilled ecological niche; (b) where introduced species perhaps of better sporting qualities or better adaptability to heavy gunning, displace native species and (c) re-introduction of indigenous species; (5) the continued introduction and release of native species already established appears to be economically impracticable as far as proven biological results are concerned; (6) additional introduction of exotics after such species have established themselves usually is impracticable at any cost consistent with the charges for public hunting licenses."

Introductions: General

Hicks, Lawrence E. The role of exotics in the Ohio Valley, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 420-424.

Abstracted from Release 133, Ohio Wildlife Research Station, in WILDLIFE REVIEW, No. 27, May 1940, p. 27.

Introductions: Goat, Rocky Mountain

Swift, Lloyd M. Rocky Mountain goats in the Black Hills of South Dakota, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 441-443.

Abstracted from South Dakota Conservation Digest in WILDLIFE REVIEW, No. 28, August 1940, p. 25.

Introductions: Hog, Wild

Shaw, A. C. The European wild hog in America, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 436-441.

Introduced into western North Carolina in 1910, the animals now interbred with domestic swine, exist in limited numbers that are kept in check by hunting. A sub-planting to California has been moderately successful. "Damage to national forest resources has not occurred to such a degree that rigid control or extinction is desirable. The situation is being further observed by administrative officers of both the Forest Service and the cooperating agency." The bulk of this paper is a condensation of LeRoy C. Stegeman's account that was abstracted in WILDLIFE REVIEW, No. 16, Nov. 1938, p. 23.

Introductions: Partridges

Gerstell, Richard. The Hungarian and chukar partridges in Pennsylvania, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 405-409.

Abstracted from Pennsylvania Game News in WILDLIFE REVIEW, No. 28, Aug. 1940, p. 25.

Life Histories: Beaver

Cox, W. T. The beaver-friend of the forest, American Forests (919 Seventeenth St., Washington, D. C. 35 cents a copy), 46(10), pp. 448-450, 476-477, 8 photos.

In checking erosion, holding back flood waters, building meadows, and checking forest fires, the beaver is a friend of the forest. General description (including original contributions) of the habits, life history, and economic value of the beaver. Most claims of damage are inspired by a desire to trap the animals for gain. Flooding can be prevented by putting through the dams at the desired level pipes that protrude several feet both above and below the structure; apparently the problem of closing these is beyond the beaver's powers.

Life Histories: Blackbird, Red-winged, sex ratio

Williams, J. Fred. The sex ratio in nestling red-wings, Wilson Bul. (J. Van Tyne, University of Michigan, Ann Arbor. 60 cents a copy), 52(4), Dec. 1940, pp. 267-277, 3 figs., 2 tables.

From author's summary: "In a study of nestling Eastern Red-wings made at Indian Lake, Ohio from June 18 to July 22 it was found that the young could be sexed by dissection at any time after hatching. With the age of nestlings known to the nearest day it proved possible to distinguish between the sexes by means of weights after the fifth day, and by means of tarsal lengths after the eighth day." The sex ratio was even.

Life Histories: Buffalo

Haines, Francis D. The western limits of the buffalo range, Pacific Northwest Quarterly (University of Washington, Seattle, Wash. 50 cents a copy), 31(4), Oct. 1940, pp. 389-398.

Compilation of the records from 33 cited publications. No dependable records of buffaloes in southern Oregon, northern Nevada, and northeastern California within historic times.

Life Histories: Condor, California

Harris, Harry. The annals of Gymnogyps to 1900, Condor (W. Lee Chambers, 2068 Escarpa Drive, Eagle Rock, Calif. 50 cents a copy), 43(1), Jan.-Feb. 1941, pp. 3-55, Figs. 1-22 (one, a col. pl.)

Abstract of the literature 1602-1900 by an accomplished bibliographer; a necessary source paper for anyone who wishes to write exhaustively of this bird.

Life Histories: Cottontail, Iowa

Hendrickson, George O. Nesting cover used by Mearns cottontail, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 328-331.

Author's summary: "From April-September, 1939, fifty-one cottontail nests were found on 118 acres of three Iowa agricultural tracts in attempts to discover all nests. The soil varied from clay to sandy loam and loess. Spring populations were estimated at 0.3-2 cottontails an acre and fall populations at 0.6-4 cottontails an acre. The ground cover was chiefly bluegrass, timothy, oats, and alfalfa, partly in open fields and partly in orchard and arboretum. One nest was under a vacant beehive. In herbaceous cover, 8 inches or taller and dense enough to conceal an adult cottontail at the time a nest was used, twenty-two nests were 0-210 feet (average 63 feet) from the nearest woody or other cover of protective value. In short herbaceous cover and strawpile, twenty-eight nests were 0-205 feet (average 24 feet) from the nearest woody or protective cover. Of the nesting materials 32 per cent was hair and 68

per cent plant debris such as was readily available. In the search for nests the elliptical bare spot of earth about 0.5 foot in area usually found in front of a nest was the most helpful sign. The average dimensions of the burrows containing nests were 3.9 inches deep, 5.1 inches wide, and 6.3 inches long. Seven nests contained an average of 3.4 living young and four nests averaged 2.5 dead young. Over a 4-year period reports of other observers of seventeen nests found at random showed an average of 6.4 young, including a maximum of 12 young of two sizes or age classes.

Life Histories: Cottontail, Pennsylvania

Beule, John D. Cottontail nesting-study in Pennsylvania, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 320-328, 2 figs., 3 tables.

Investigation made in Centre and Lehigh counties. Author's summary: "(1) Twenty-five active nests and sixty-six old nests were found by systematic search from April 1, 1939, to September 15, 1939. Eighty-six nesting cavities that were never completed as nests were also found by this method; (2) nests were located in a variety of habitats, but the majority were found in wastelands, alfalfa, orchards, and hayfields; (3) the peak of nesting activities was recorded late in May and early in June, and progressively fewer nests were found throughout the remainder of the nesting season; (4) twenty-six litter counts ranged from three to eight young and averaged 5.42 in a litter. Larger litters were found early in the season; (5) one female, known to be in her first breeding season, had only one litter for the year; (6) ordinarily the female rabbit returned to the nest only to feed the nestlings. A timing apparatus recorded one feeding period about dusk and indicated a second feeding period about dawn. Young rabbits could call the female in time of danger by squealing; (7) skunks, the larvae of the flesh-fly (Wohlfahrtia vigil), and man destroyed nine of the twenty-five active nests under observation. Reliable cooperators noted the destruction of one nest by a weasel and of another by shrews or mice; (8) the presence of the pellets of the young in or about the peripheries of a nest seemed to indicate success for that nest. Twenty-two of the thirty-four old nests examined contained pellets and indicated the success of 64.7 per cent, as compared with the known success of 64 per cent of twenty-five active nests." Bibliography of 9 titles.

Life Histories: Duck, Ruddy

Zimmerman, F. R. The ruddy duck in Wisconsin, The Passenger Pigeon (W. E. Scott, Wisconsin Dept. of Conservation, Madison), 2(10), Oct. 1940, pp. 111-116, 2 figs.

Largely compiled account, treating local names, and nesting in Wisconsin and in other regions. Bibliography of 21 titles.

Life Histories: Gull, Franklin's

DuMont, Philip A. Relation of Franklin's gull colonies to agriculture on the Great Plains, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 183-189, 3 tables.

Franklin's gulls, originally of rather restricted breeding distribution and migration route, and further cramped by desiccation of their plains environment, have responded notably to the new facilities for nesting offered them by the migratory bird refuges. Resort to 8 of the refuges is described; colonies have included up to 20,000 nests. The birds feed largely over nearby agricultural land and must be a great factor in insect destruction. Bibliography of 6 titles.

Life Histories: Hawk, Pigeon

Craighead, John and Frank. Nesting pigeon hawks, Wilson Bul. (J. Van Tyne, University of Michigan, Ann Arbor. 60 cents a copy), 52(4), Dec. 1940, pp. 241-248, 4 photos, 1 table.

Report on observations of the nesting and feeding habits and of the occupants of 3 nests in Minnesota and 4 in Ontario. Food chiefly dragonflies, in part swallows.

Life Histories: Lapwing

Rinkel, G. L. Waarnemingen over het gedrag van de kievit (Vanellus vanellus (L.)) gedurende de broedtijd [Observations on the behavior of the lapwing during the breeding season], Ardea (Dr. C. C. A. Junge, Rijksmuseum van Natuurlijke Historie, Leiden, Holland), 29(2-3), July 1940, pp. 108-147, pls. 6-7, 9 figs. Summary in English.

While the lapwing is an A. O. U. Check-List bird, it is only a straggler to our continent. This paper is called to attention mainly because it makes a few suggestions for management of a shore bird. The migrations and breeding habits of this distinctly "territorial" species are described. Eggs of the lapwing are harvested in Holland and the management suggestions relate to that use. Leaving in the nest any proportion of the clutch of four down to a single egg does not activate further egg-laying but the female will incubate the residue. When the entire clutch is removed, however, the female will lay the first egg of the new clutch seven or eight days later. Three clutches may be removed and a fourth will be laid and incubated. An increase in lapwing population might be promoted by enlarging suitable breeding grounds and by minimizing disturbances to the breeding birds and thus increasing bigamy. Bibliography of 23 titles.

Life Histories: Mouse, White-footed

Nicholson, Arnold J. The homes and social habits of the wood-mouse (Peromyscus leucopus noveboracensis) in southern Michigan, Amer. Midland Naturalist (Notre Dame, Ind. $1.00 a copy), 25(1), pp. 196-223, 3 figs., 1 table.

A study made in Michigan by the use of nest boxes and by marking individuals. The box is illustrated and methods of the study are described. Two hundred and eighty-eight individuals were handled, of which 60 percent were taken more than once; some as many as 10 to 25 times. The results are discussed under the headings of: Nest sites, seasonal variation in use of nest boxes, construction of nests, sanitation, co-residents, food and food storage, periods of residence, local movements, dispersal, sex ratio, relationship between adults and young, association of males with females, and inbreeding. The findings are discussed and summarized. Bibliography of 11 titles.

Life Histories: Otter, Sea

Scheffer, Victor B. The sea otter on the Washington Coast, Pacific Northwest Quarterly (University of Washington, Seattle, Wash. 50 cents a copy), 31(4), Oct. 1940, pp. 370-388, 2 pls., 1 map.

The depletion of this race (Enhydra lutris nereis) by the fur trade, the use of the animal by the natives, and the finishing off of the otters by riflemen, are the subjects of this historical compilation. References to about 15 publications.

Life Histories: Pheasant

Randall, Pierce E. The life equation of the ringneck pheasant in Pennsylvania, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 300-320, 9 figs., 12 tables.

The study was made in Lehigh County on land typical of first-class pheasant range and in one of the most productive agricultural sections of the State. Author's summary: "The pheasant population of the 1,675-acre study tract in the fall of 1938 was 950 birds, or 1 bird to 1.8 acres. Hunting and associated losses reduced the population to 300 pheasants in early December. Although the approach of the breeding season in late March apparently increased the vulnerability of the pheasants to predation, winter mortality was low. The study-area population dropped to 204 birds before spring. Many pheasants left the area during the winter when hand-picked standing cornfields were destroyed. The availability of standing cornfields and winter carrying capacity of a Pennsylvania area for pheasants seemed to be closely correlated. A breeding population of about 1 bird to 8 acres and a sex ratio of 1 cock to 7 hens occurred on the study area. In spite of the unbalanced sex ratio, 94.1 per cent of the eggs were fertile.

During this study 310 nests were under observation. The nesting season extended from April through August, reaching its peak in May and June. About half of the nests on the study area were in hayfields. Other important nesting cover included wheat, roadsides, and wasteland. In many hayfields a density of 1 nest to an acre was observed. The maximum density recorded was on a measured acre where ten nests were simultaneously occupied. When the density of nests approached or exceeded 1 to an acre, there seemed to be no tendency to seek a peripheral zone. The grouping of nests in certain parts of a field was often dependent upon the location of crowing areas. The number of eggs in a clutch decreased as the season advanced. This indicated that wildlife managers should encourage farming practices that would enable the first clutch to succeed. On the study area 25.4 per cent of the nests were successful. Nest mortality was large in all the important nesting covers, and no 'best' type for nesting was discovered. Mowing was the most serious cause of nest destruction, accounting for 49.8 per cent of the nesting losses. Predators were responsible for 30.7 per cent of the nest failures. Skunks and crows were the most serious nest-destroying species. Through renesting efforts, between 52 and 55 per cent of the hens on the study area raised broods. Juvenile mortality was comparatively low, as only 12.4 per cent of the hatch failed to reach maturity.

The population of the study area in the fall of 1939 was about 850 birds. This was an increase of 317 per cent from the breeding population, but it represented a reduction of 100 birds from the population in the fall of 1938. This decline in population was general throughout the pheasant range. The early summer drouth was believed responsible, as the mowing was done unusually early. The haying operations destroyed many nests that were within a few days of hatching. Delay of the mowing for one week on the entire study area would have increased the number of successful nests by 20 per cent."

Bibliography of 21 titles.

Life Histories: Rabbit, European

Southern, H. N. The ecology and population dynamics of the wild rabbit (Oryctolagus cuniculus), Annals of Applied Biol. (Cambridge University Press, 200 Euston Road, N.W. 1, London, England), 27(4), Nov. 1940, pp. 509-526, Pl. 22, 2 figs., 3 tables.

Techniques of live-trapping and ear-marking the rabbits are described as is also the habitat in Berkshire, England, where the work was done. Biology is treated under sections on: Feeding areas, food and feeding habits, excreta, feeding rhythms, sex differences, age determination, reproductive physiology, colonization, disease and parasites, aberrant types, and migration. Vital statistics discussed include: The survival rate, distribution of births and disappearances, turn-over in the population, and mortality. Bibliography of 19 titles.

Life Histories: Shrew, Smoky

Hamilton, W. J., Jr. The biology of the smoky shrew (Sorex fumeus fumeus Miller), Zoologica (New York Zoological Society, New York, N. Y.), 25(4), Dec. 1940, pp. 473-492, 4 pls., 1 fig., 1 table.

Report on intermittent, but in part intensive, studies begun in 1927. Description of the animal, including its measurements and weight, is full. The article contains sections also on habitat, activity, associates, burrows and nests, voice, senses, food, reproduction, dermal glands, life span, populations, and enemies. Age classes can be separated by weights; the food is 80 percent insect; litters average 5.5 in number; the life span is short--14-17 months; populations vary from 5 to 50 individuals per acre in late summer but only 20-25 percent of the whole number survives the winter. Bibliography of 21 titles.

Life Histories: Tortoise, Desert

Woodbury, A. M., and Ross Hardy. The dens and behavior of the desert tortoise, Science (Lancaster, Pa. 15 cents a copy), 92(2397), Dec. 6, 1940, p. 529.

Gopherus agassizii. Preliminary statement of the results from studies of 68 dens and the marking of about 500 animals. Notes on habits and characteristics of dens; territories vary from 10 to 40 acres.

Life Histories: Woodpecker, Ivory-billed

Tanner, James T. Three years with the ivory-billed woodpecker, America's rarest bird, Audubon Magazine (formerly Bird-Lore, 1006 Fifth Ave., New York, N. Y. 35 cents a copy), 43(1), Jan.-Feb. 1941, pp. 5-14, 4 pls.

The decline of the ivory-bill resulted chiefly from the destruction of essential habitat by logging operations with random shooting and collecting as accessory causes. The bird apparently persists in small numbers in five localities in Louisiana, Florida, and possibly South Carolina. Notes are given on character of habitat, and on feeding, courting, and nesting habits. Suggestions are made as to how the species may be preserved.

Management: Aquatic plants

Anderson, Harry G. Studies preliminary to a waterfowl habitat restoration program along the Illinois River, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 369-373.

The Illinois River valley attracts a large flight of waterfowl but profound changes in the environment, due to causes that are specified, have progressively decreased the utility of the area to the birds. To take care of the present and anticipated larger future concentrations, it is imperative

to improve conditions, especially with respect to fluctuations and turbidity. The relation of changing water level to the growth of 6 important aquatic plants is stated; all but one--the lotus--do better under stabilized conditions. The food supply for waterfowl is most abundant where water levels are constant; and scarcity due to inconstancy forces birds to cornfield feeding. Lotus and river bulrush dominate large areas but produce little food; practicable means of control are desirable. The 15 most desirable native duck foods are listed; they are generally dependent on stable water levels for satisfactory growth.

Management: Aquatic plants

Griffith, Richard E. Waterfowl management on Atlantic Coast refuges, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 373-377.

Types of environment are specified, the most desirable having a combination of fresh and brackish water. "The five principal management practices are: water manipulation, planting, vegetation control, controlled burning, and the production of supplementary food crops." Examples of the employment of each of these measures are described.

Management: Cottontail

Patton, C. P. Management of the cottontail rabbit in North Carolina, North Carolina Wildlife Conservation (Division of Game and Inland Fisheries, Raleigh), 5(1), Jan. 1941, pp. 3-4, 15-16.

Many who do not realize the value of rabbits for sport and food, consider them as pests and are anxious to extirpate them. Rabbits are often unjustly blamed for poor crop growths on field borders but that is usually due to the competition of tree roots. Damage is done, however, and methods of control are suggested, especially those which do not involve killing the animals. Natural enemies of rabbits are listed. Certain areas of the State are not fully stocked with cottontails but can be better populated through protection and management. Suggestions are made as to food and cover plants that may be favored, and also on construction of brush piles, and planting of soybeans and late corn to attract the animals to places where they can best be tolerated.

Management: Duck, Wood

Hawkins, Arthur S., and Frank C. Bellrose, Jr. Wood duck habitat management in Illinois, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 392-395.

About 15 percent of artificial nesting sites, provided in considerable numbers during 2 years, were occupied. They may vary considerably as to external appearance but should meet certain specifications as to size of

cavity and entrance, which are given. Other suggestions as to construction and placement are made. Cypress boxes were built at a cost of about a dollar each. Other occupants of the nest boxes, predators, and habitat requirements are discussed. Large numbers of the birds feed after harvest in corn and other grain fields; hence feed patches appear to be a desirable feature of management.

Management: Electric fence in

Burr, J. G. Electric fences that repel deer, Science (Lancaster, Pa. 15 cents a copy), 92(2397), Dec. 6, 1940, pp. 529-530.

A single electrified wire strung 5 feet outside the regular fence of the area to be protected was successful, apparently because the deer did not like to make the broader jump, paused to investigate the outer line, and received a repellent shock.

Management: Farmer-sportsman relationship

Chalk, John D., D. I. Rasmussen, Frank C. Edminster, Colin McF. Reed, Arnold Nicholson, and J. Paul Miller. Is the farmer-sportsman council the answer?, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Conference, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 54-73, with discussion pp. 73-82.

Chalk. Suggests appointment of a committee to make a thorough study of the subject.

Rasmussen. The State Game Refuge Committee and the Board of Big-game Control of Utah furnish an example of an organized body of representatives of various interests meeting together and arriving at a concerted program. The committee was first appointed to take action on problems resulting from re-introduction of the elk. That introduction and its effects are described, and the conflict between the interests of game and livestock in western States, and particularly in Utah, is reviewed. The committee performed its own field investigations, invoked cooperation, and held hearings; it had power to define boundaries of preserves and to regulate all activities upon them and to determine and regulate special big game hunting seasons. In illustration of its work, regulation of the original trouble-making Nebo elk herd is cited. From 1931 to date, it has been maintained at from 500 to 600 animals; in that period, 1,438 individuals were removed. Statistics are given as to transplantings, removals, and numbers of this and 7 other elk herds in the State. Deer problems have been alleviated by sale of special permits to kill antler-less animals. The committee has functioned harmoniously, efficiently, and fairly.

Edminster. Abstracted from a Soil Conservation Service leaflet in WILDLIFE REVIEW, No. 27, May 1940, p. 25.

Reed. Local rather than national handling of the farmer-sportsman problem seems the only possibility. Payment for hunting rights may be prac-

ticable on large areas under a single management but not on small farms. Pennsylvania experience with State hunting lands, and State-farmer, and sportsmen's club-farmer, cooperatives is outlined. To protect their hunting privileges, sportsmen must control vandalism.

Nicholson. Instruction of the youth, who in the next generation, will have the farm-hunting problem to handle, is the plea of this speaker. He agrees with Reed that local, not national, effort at improvement seems most feasible.

Miller. Refers to the American Game Policy as fundamentally sound and thinks a national council might be useful in making a similar contribution to the philosophy of the farm hunting problem.

✗ Management: Farmer-sportsman relationship

Miller, J. Paul, and Burwell B. Powell. Why more wildlife is not produced on agricultural land, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 359-363.

Tentative conclusions drawn from a 2-year survey covering the entire United States. Nearly 90 percent of the potentially huntable land is devoted primarily to agricultural uses. Farm game constitutes 85 percent of the total national bag. The authors estimate that 82 percent of the available food and cover for wildlife (and 84 percent of that which it is feasible to manage) are on land devoted to agriculture. Game management methods often call for changes in farm practices but as such changes are adopted, as a rule, only upon proof of their utility to the farmer, wildlife managers must be prepared to demonstrate sufficiently attractive returns. For reasons that are cited, the authors doubt the practicability of farm game management for profit. Furthermore, on account of trespass difficulties, farmers are likely to consider game a liability rather than an asset. Cooperative programs usually have failed because promised protection from trespass (the chief tangible benefit to the farmer) has not materialized. It is the farmers who will ultimately determine the place of wildlife in our social structure and any schemes for management and utilization of farm wildlife must be such as they can approve, which means that they must fit into prevailing agricultural practices and land-use programs.

Management: Forest wildlife

Anon. Annual wildlife report 1940, Region One (U. S. Forest Service, Missoula, Mont.), 34 pp. (mimeographed), 1941.

The status of each big game animal is discussed, and wildlife activities, studies, and cooperation are described. The bulk of the leaflet is made up of tabulations of: Wildlife population estimates covering big game, predators, and fur animals; the estimated take of the same groups; reduction in numbers of big game by predators, starvation, disease, and other causes; days of use by hunters, trappers, and fishermen; acreage of State and Federal

game refuges on the forests and of other wildlife areas administratively designated; and results of law enforcement activities.

Management: Forest wildlife

Anon. Annual wildlife report 1940, Region Six (U. S. Forest Service, Portland, Oreg.), 20 pp. (15 of them tabulations) (mimeographed), 1941.

Points of interest connected with the management of wildlife on the national forests of this northwestern region, including: Elk herd regulation, browse studies, propagation of bitterbrush, planting of willows, and cooperation with State game departments. The statistical information embraces the customary estimated: wildlife censuses, hunter and trapper take, and drain from all other sources, the estimated kill by predatory animals being itemized. The number of days of hunter and fishermen use also is tabulated, and reports made on wildlife areas, livestock use, and law enforcement.

Management: Fur animals

Anon. Furbearers offer a profit to farmers, Missouri Conservationist (Missouri Conservation Commission, Jefferson City), 3(2), Dec. 1940, pp. 1, 7, 3 figs.

As late as 1920, Missouri trappers received a million dollars for their catch. Although returns have since declined to less than half that amount, fur animals are still an important source of income and some of them are of value on account of their food habits. Suggestions are given as to management to maintain this resource, especially measures that can be taken on individual farms.

Management: Fur animals

Olson, Herman. Fur bearers of the Superior, Conservation Volunteer (Minnesota Dept. of Conservation, St. Paul), 1(5), Feb. 1941, pp. 37-39.

Popular account of the species, their habits, and status. The principal factors in proper management are enforcement of protective laws that should be founded on determination of land-carrying capacity and of the abundance and allowable take for the different species. In a more advanced state of fur farming, restocking may be possible.

Management: Goose, Canada

Williams, C. S., and C. A. Sooter. Canada goose habitats in Utah and Oregon, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 383-387, 2 tables.

"The environment most important to geese is that required for breeding. It must not only meet the needs for nesting but must also contain within a comparatively limited area acceptable conditions for molting, brooding, resting, and feeding." A tabulation gives the number and percentage of nests in various types of cover in both States; they were most numerous in hardstem bulrush. Muskrat lodges were important as foundations for goose nests. Other preferences and habits of the birds, and how they may be catered to in management, are pointed out.

Management: Harvesting pheasants

Carlson, C. Edward. Minnesota's pheasant population, Conservation Volunteer (Minnesota Dept. of Conservation, St. Paul), 1(5), Feb. 1941, pp. 65-67.

Regulation of the kill is based on roadside counts; that for 1939 is described. The annual kill has averaged more than a million since 1932; figures are given also for Ohio, Oregon, Pennsylvania, Iowa, and Michigan, all smaller; and for South Dakota, larger. The Minnesota pheasant population is worth a million dollars annually and deserves careful management.

Management: Muskrat in relation to waterfowl

Krummes, William T. The muskrat: A factor in waterfowl habitat management, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 395-398.

In newly developed aquatic habitats, muskrats are destructive through burrowing into dikes, and in consuming waterfowl food and cover plants, especially those that have just been introduced; under these conditions the animals must be controlled. In established marshes, muskrats are useful in thinning the vegetation, especially in making trails and ponds; their lodges also provide foundations for many waterfowl nests.

Management: Planting willows

Seaman, Ellwood A. Plan to plant willows, Ohio Conservation Bulletin (Division of Conservation and Natural Resources, Columbus. 10 cents a copy), 5(3), March 1941, pp. 18-19, 5 photos, 1 drawing.

Although prepared with reference to fish management, this paper is of value in other fields for its directions for storing cuttings and for planting and other suggestions.

Management: Private shooting preserves

Williamson, Leslie A. Regulated private shooting preserves in Connecticut, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 354-359, 5 tables.

The regulations under which the preserves are established and conducted are explained. Of 20 areas put under this type of management since 1933, 7 have been operated by individuals, 9 by clubs, and 4 commercially; 1, 2, and 2 of these, respectively, were discontinued. The tables relate principally to the kill and the proportion it bore to the number of birds liberated (averages 30 to 46 percent).

Author's summary: "(1) Regulated private shooting perserves have been operating in Connecticut for the past six years; (2) private shooting preserves, operated under the regulations cited, do not seem to be harmful to the public interest; (3) at the present time hunting on private preserves does not appear to appreciably lessen the hunting pressure on public shooting areas; (4) the variation in percentage of kill on the different types of preserves is believed due to the hunting pressure; (5) over a 6-year period on the private shooting preserves, there was a difference between the number of birds liberated and the number killed of 21,252 birds. It is concluded that a considerable percentage of these birds drift off the preserves and are available to hunters on areas open to public shooting."

Management: Range appraisal

Swift, Lloyd W. Some criteria for determining proper forage utilization by big game on winter ranges, Journ. Mammalogy (W. B. Davis, College Station, Texas. $1.00 a copy), 22(1), Feb. 1941, pp. 47-53.

Comment on instances of overpopulation and depletion of environments. Winter range is usually the limiting factor. Methods of determining overuse are discussed and 4 criteria of overbrowsing are described and annotated. For determining initial stages of deterioration in big game winter range, the author's suggestions are: "(1) Locate the key areas, where game naturally concentrate or are concentrated during the severest part of the winter; (2) determine the key species [of plants], that is, the common and preferred species in the key area. Observe the degree of utilization, assuming that one-half use of annual growth in length on shrubs and one-half volume of perennial grasses is the most desirable; (3) observe the soil condition closely, to check on the first signs of advanced erosion as indicated by loss of surface soil through sheet erosion."

Management: Refuges, Federal

Anon. State has 17 national refuges, Florida Game and Fish (Commission of Game and Fresh Water Fish, Tallahassee, Fla.), 2(1), Jan. 1941, p. 8.

Name, date established, county in which located, and acreage; total 84,441 acres.

Management: Refuges, Waterfowl

Pirnie, Miles D. Small area management for waterfowl, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 387-391.

The objectives and techniques of management are listed and discussed. The author's summary and conclusions are: "(1) Areas of 1,000 to 5,000 acres may be successfully managed to provide protection and food for waterfowl and also to furnish outdoor recreation and nature education for people; (2) protection techniques include fencing, posting, and patrolling; (3) habitat modifications often can create new resting and feeding grounds at relatively low cost; (4) owing to their ability to forage for themselves, wild waterfowl concentrated at sanctuaries are by no means wholly dependent on artificial feeding; (5) protection and feeding do not pauperize wild waterfowl or destroy their migration instincts. Waterfowl do not always use the protection and foods available to them; (6) small refuge areas may greatly increase the local kill of ducks and geese during the heavy flights. In average years they may cut down local kills and save many birds; (7) restocking with captive waterfowl is yet in the experimental stage, although success has attended a few efforts with the Canada goose; (8) caution must be exercised in drawing conclusions from brief tests or limited management experiments, because waterfowl behavior varies greatly from year to year. True causes are difficult to determine, and the results obtained one year cannot always be repeated even under apparently identical conditions."

Bibliography of 8 titles.

Management: Restoration

Day, Albert M. How goes the Pittman-Robertson Act?, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 36-40.

General account of this Federal legislation for wildlife restoration and of the program developed under it. Forty-three States have qualified for benefits and 180 of their projects have been approved. Illustrative examples are cited. The carrying out of the legislation has resulted in greatly increased employment by the States of men trained in wildlife management or the biological sciences. The act has also worked against the tendency to divert game-license funds to other than conservation purposes. The Biological Survey restricts its activities to approval of projects that are substantial in character and that are capable of restoring conditions suitable for wildlife.

Management: Salting

Anderson, I. V., and Raymond M. West. The distribution of salt for big game animals, Forest Service, Northern Rocky Mountain Region (Missoula, Mont.), Field Notes on Wildlife, 2(7), March 1941, 4 pp. (mimeographed.

Discussion of the objectives, technique, and expense of salt distribution. A manual of the subject for Forest Service employes. Authors' summary: "(1) Big game salting is practiced primarily for the purpose of properly distributing animals on the range to obtain more uniform use of forage, and thereby eliminate range damage by over-utilization, particularly on winter ranges; (2) the value of salting to supply a dietary deficiency is a secondary consideration at present; (3) salt grounds should never be located on critical winter range; (4) locate salt grounds between heads of minor drainages and on secondary ridges at lower limits of summer range and on summer range proper; (5) placing salt in natural licks is seldom, if ever, good practice; (6) use from 50 to 400 pounds per salt ground, with an average of 200 pounds; (7) place salt in field by June 15; (8) the cost of distributing salt on national forest ranges should be borne jointly by the State and Forest Service on a 50-50 basis."

Management: Seed harvesting and storage

Kubichek, W. F. Collecting and storing seeds of waterfowl food plants for propagation, Trans. Fifth N.A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 364-368, 1 fig.

Suggestions from experience of the Biological Survey as to gathering, curing, and storing seeds of several species of marsh and water plants. Seeds of species growing where grain-harvesting machinery can be used have been reaped, dried, and stored at costs of from 25 to 50 cents per bushel. Those of sago pondweed have been collected, cured, and cleaned on a large scale for 14 cents a pound. Methods for both dry and wet preservation are described, including use of a concrete storage cellar, description and plans for which are given.

Management: Seed treatment

Barton, Lela V. Germination of seeds, Scientific Monthly (Science Press, Lancaster, Pa. 50 cents a copy), 51(6), Dec. 1940, pp. 542-544.

Methods by which dormancy may be broken, including softening of hard seed coats, exposure to low or alternating temperatures, or to bacteria that break down the refractory shells, and removal of seed coverings. Various groups of plants utilized by wildlife managers are mentioned.

Management: On small farms

Gilfillan, Merrill C. Is wildlife management practical near population centers?, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 344-347, 1 table.

Study on a 1,576-acre tract of small farms in an industrial area in northeastern Ohio. Food patches were experimented with and restricted to

corn; safety zones were provided. The game and fur harvested are discussed and their value itemized. Author's summary: "(1) Wildlife management as practiced on this area is compatible with good farming and is acceptable to farmers; (2) the optimum of wildlife management was achieved on this area by managing swamps, planting food patches adjacent to swamps and saving game bird nests. A more intensive program might evoke the law of diminishing returns; (3) these practices produced a harvestable surplus of wildlife great enough to satisfy farmer and sportsman. The yield per square mile was 406 pieces of fur and game harvested in 1938 and 249 pieces in 1939; (4) the proximity of population centers created a demand for this surplus and provided a ready market which repaid farmers for their efforts; (5) the income from the fur crop represented profit to the farmers; (6) this income was great enough to justify the necessary changes in land-use; (7) the net income per acre from submarginal land compared favorably with that of farmed land."

Management: Soil conservation in relation to wildlife conservation

Parker, Lansing A. Soil conservation and wildlife, Conservation Volunteer (Minnesota Dept. of Conservation, St. Paul), 1(5), Feb. 1941, pp. 20-23.

The benefit of soil conservation practices to wildlife, of which definite instances are cited for songbirds in Ohio, and for the Hungarian partridge, pheasant, bob-white, and waterfowl in Minnesota. Eighty percent of the farmers in the Caledonia project regarded the work as beneficial to wildlife. There is some comment also on farmer-sportsman relationships.

Management: Soil conservation in relation to wildlife conservation

Van Dersal, Wm. R. Environmental improvement for valuable non-game animals, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 200-202.

Wildlife is a product of the land and as patterns of land-use change, so do wildlife populations. As 85 percent of the land of the United States is in agricultural use, it follows that wildlife management rests largely in the hands of farmers. As a rule they are not specifically interested in game production, but by practicing environmental improvement of value to themselves, they indirectly benefit wildlife--in its natural proportions, chiefly non-game. These species themselves are largely beneficial through consumption of insect and other pests. The author cites examples of soil conservation practices that have directly benefitted wildlife. Among them are: Strip-cropping, excluding grazing livestock from woodlands, and maintenance of hedgerows; others are more briefly mentioned. "As long as wildlife conservation can be so combined with other land uses as to make it necessary to practice for other reasons than wildlife production, then whether or not wildlife is of immediate interest to the landowner makes little difference--wildlife is still produced."

"If it ever becomes possible to appraise any given situation in terms of benefits accrued above the cost of wildlife management--and this in terms of cash, not words--perhaps landowners may undertake management measures aimed solely at wildlife production and nothing else. But until that time comes the economic establishment of wildlife production on most of the land in the United States must depend upon its integration with and contribution to agriculture."

Management: Stocking, turkey

Hopkins, Frank. The wild turkey problem in Wisconsin, Wisconsin Conservation Bul. (Wisconsin Conservation Dept., Madison), 5(12), Dec. 1940, pp. 47-48, 1 table.

In 10 years nearly 3,000 pen-raised wild turkeys were stocked but the birds flocked to farms and became nuisances. They were not wary enough to protect themselves from predators and hunters. Stocking has been discontinued.

Management: On stripped areas

Yeager, Lee E. Wildlife management on coal stripped land, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 348-353, 1 pl., 1 table.

Stripped areas comprising a considerable acreage in mid-western States are difficult to revegetate. Several tree and shrub pioneer invaders are listed; the first important upland herb is white sweetclover; other early comers are mentioned. Cattails, muskgrasses, and waterweed are first to establish themselves in aquatic habitats. As the successions mature, animal life is attracted and increases. On black prairie, the older mined areas (15-30 years) may support larger game populations than nearby farms but the reverse is true of mines contrasted to good natural habitat. Overgrown stripped areas have sanctuary value. Management suggestions are made.

Management: Waterfowl

Cartwright, B. W. Restoration of waterfowl habitat in western Canada, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 377-382.

Notes on impoundment of water, excavation of ponds, fencing, guarding, and other activities for improvement of wild fowl habitat. The work has been applied to 530,000 acres. Statement of support and cooperation.

Management: Winter feeding

Fox, Adrian C. Winter feeding for game birds (State Game and Fish Department, Bismarck, N. Dak.), 16 pp. (5-3/8 x 8-1/8), illus.

Wildlife in North Dakota often needs artificial feeding. Natural foods and deficiencies in food and cover are discussed. Feed patch recommendations are made and feeding stations described and liberally illustrated. Care of stations, advantages of feeding, and available literature also are treated.

Natural History: Tundra animals

Shelford, V. E., and A. C. Twomey. Tundra animal communities in the vicinity of Churchill, Manitoba, Ecology (Prince and Lemon Sts., Lancaster, Pa. $1.50 a copy), 22(1), Jan. 1941, pp. 47-69, 16 figs., 7 tables.

General ecological account in which vertebrates receive consideration. The tundra vegetation presents a minimum of shelter for animals. The larger forms tend to invade all stages of the biome. Bibliography of 68 titles.

Predation: Crow-waterfowl relationships

Hammond, Merrill C. Crow-waterfowl relationships on Federal refuges, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 398-404, 2 figs., 1 table.

Summary of observations by Kalmbach, the author, and a number of refuge managers. A table records the percentages of early and late nest destruction at 3 localities in various years. On 16 owned, and 70 easement, refuges, nest losses through crow predation varied from 0 to 30 percent. Destruction varied almost directly with the number of nests available. Quality of nesting cover did not seem to be an important factor. At not more than 8 of the refuges was duck-nest predation by crows looked upon as important. Mallard and redhead nests appeared to be the most vulnerable, and in general the greatest damage was done during the laying period. Bibliography of 9 titles.

Predation: On fishes

Hubbs, Carl L. Predator control in relation to fish management in Alaska, Trans. Fifth N. A. Wildlife Conference 1940 (1941) (American Wildlife Institute, Investment Bldg., Washington, D. C. $1.00 a copy), pp. 153-162, 4 photos.

A difficulty with bounty payments in Alaska is that the natives come to regard them as vested interests and demand their maintenance and even extension. Birds and mammals mentioned by the author include: Gulls, terns, fish ducks, the bald eagle, hair seal, and bears. None are regarded as materially injurious in relation to Alaskan fisheries. Most eating of salmon ova is of loose eggs that would be lost anyway; there is little chance of any egg hatching that is not buried in gravel, and few of these are taken by predators. "Predator control seems always destined to bring conflicting wildlife interests into clash. Administrative decision should therefore rest on a full understanding of all points of view, and on all facts which can be determined by impartial and penetrating research."

Propagation: Preventing flight

Schroeder, Chas. R., and Karl Koch. Preventing flight in birds by tenotomy, Journ. Amer. Vet. Med. Assoc. (600 S. Michigan Ave., Chicago, Ill. 75 cents a copy), 97(761), Aug. 1940, pp. 169-170, 4 figs.

Citation of 6 publications dealing, at least in part, with control or prevention of flight in birds, and description and illustration of a new method--severing by cautery of a tendon at the wrist joint. The operation is simple, sterile, and produces no hemorrhage or other undesirable results.

Research: Hair identification

Hardy, J. I., and Thora M. Plitt. An improved method for revealing the surface structure of fur fibers, U. S. Dept. of the Interior, Wildlife Circ. 7 (Supt. of Documents, Washington, D. C. 5 cents a copy), 10 pp., 3 pls., 1940.

Review of the development in methods of studying hair; that of the authors described; characteristics of the surface markings of hairs discussed and illustrated for those of the mink, silver fox, muskrat, and beaver. Bibliography of 18 titles.

Authors' summary: "Impressions of the external structure of whole fibers can be quickly obtained with a few simple materials. The imprints are made on thermoplastic film that softens slightly below 100° C. Ordinary clamps hold the fibers and film firmly together while they are heated in a laboratory oven for about 15 minutes. The imprints are readily examined under the microscope and identified by comparison with known samples. The minute changes in the surface of a fur fiber, as they may be affected by feeding, breeding, and management, may be followed throughout its entire period of growth. Examination of fibers for identification in studies in agriculture, industry, criminology, and forensic medicine is considerably facilitated."

Research: Illinois

Frison, Theodore H. A report of the Natural History Survey, Ann. Rep. Illinois Dept. of Registration and Education (Springfield, Ill.), 1939-40, Reprint separately paged, 1-27, illus.

A map shows the location of field stations and study areas; the expanded wildlife program is described; and separate discussions are given of upland game studies, rabbits and tularemia (485 human cases reported in 1939), and of waterfowl and fur animal investigations.

Research: Illinois

Frison, Theodore H. Enemies of natural wealth yield as science rebuilds resources, Blue Book State of Illinois, 1939-1940, pp. 480-501, illus.

Section headings indicative of contents are: Hedgerows are important to agriculture and wildlife, prairie chickens increase in areas seeded to redtop, Illinois leads in investigation of migratory ducks, Pittman-Robertson program involves important resources, seek to correlate game and farming practices, and new laboratories to develop game and fish. A list of both official and unofficial publications prepared by the staff that appeared 1937-39 is given.

Probably the best place to apply for both this and the preceding publication is the State Natural History Survey, Urbana, Ill.

Research: Live trap

Johnson, M. W. A simple "live" trap, Science (Lancaster, Pa. 15 cents a copy), 92(2395), Nov. 22, 1940, p. 490, 1 fig.

Made from an ordinary snap trap, a cigar box, string, and rubber band; total cost 5 cents.

U. S. Government: Interior Department

Ickes, Harold L. Annual Report of the Secretary of the Interior for the fiscal year ending June 30, 1940 (Supt. of Documents, Washington, D. C. 75 cents a copy), xxxi+528 pp., illus.

Embraces reports of all the constituent agencies as well as that of the Secretary, proper. Sections relating to terrestrial wildlife are: Letter of Transmittal by the Secretary. Bureau of Biological Survey, pp. xii-xiii. Notes on reorganization, appropriations, refuge system, increase in wildlife incident to the defense movement. The nation "must prudently conserve this great natural resource as one of the American requirements for good living."

National Park Service. Arno B. Cammerer. Wildlife studies and management, pp. 179-181. Note on transfer of the Wildlife Division to the Biological Survey. Prey-predator ecology continued to be the major research project but numerous other activities are mentioned. Management consisted chiefly in regulating various herds of big game to the capacity of their environment.

Bureau of Biological Survey. Ira N. Gabrielson. pp. 223-290. Fifty-fifth annual report of this organization and last under the name cited. Changes resulting from executive reorganization are fully explained; they leave the Federal Government in better position than ever before to carry on the work of wildlife restoration. The general status of wildlife and its conservation are summarized and outstanding events of the year are noted in 25 brief paragraphs. The report contains the usual comprehensive statement of the work of the Survey which is so succinct as to be almost of abstract character in itself. Some of the more important parts are: An analysis of the waterfowl situation (increase 1935-1940, 27 to 65 million ducks, geese, and swans); summary of the work of the cooperative wildlife research units;

progress in Federal aid in wildlife restoration (237 projects under way); status of the national wildlife refuge program (263 refuges totalling more than 13-1/2 million acres); control of injurious animals; and conservation in Alaska.

Bureau of Fisheries. Charles E. Jackson. Alaska fur-seal service, pp. 303-306. Number of seals (more than 2,000,000), take of sealskins, and manufacturing of by-products; also notes on the fox industry of the Pribilof Islands and protection of sea otters, walruses, and sea lions.

Grazing Service. R. H. Rutledge. Wildlife, pp. 346-347. Cooperation in adjustment of livestock and wildlife interests.

Civilian Conservation Corps. Conrad L. Wirth. Wildlife conservation, pp. 406-407. Summary of work of an average of 35 camps on Biological Survey projects, that on the Savannah River Refuge particularized.

U. S. Government: Wildlife Service, Federal aid

Rutherford, R. M. Wildlife restoration through State and Federal cooperation under the provisions of the Pittman-Robertson Act, Journ. Forestry (Mills Bldg., 17th St. & Pennsylvania Ave., N. W., Washington, D. C. 50 cents a copy), 39(2), Feb. 1941, pp. 157-160.

Nature of the act, source of funds, manner of their distribution. Forty-four States are actively participating and in the first two and one-quarter years of operations, 341 projects were approved. Illustrative undertakings are described. Land purchase, development, research, and survey activities are included, some of which involve cooperation between States. It is planned to publish reports upon all investigations.

WILDLIFE LEAFLET

An issue of interest to wildlife managers additional to those previously mentioned is listed below. Copies of these mimeographed leaflets can be obtained from the Fish and Wildlife Service, U. S. Department of the Interior, Washington, D. C.

176. Animal and plant resources of Alaska, by L. J. Palmer, 12 pp., January 1941.

General account of Alaska as a home for wildlife, its fauna and flora, depletion of wildlife, importance of this resource, and the need for management, with notes on the present administration of wildlife and upon investigations in progress.

NOTES AND NEWS

"The Reporter" published in the interests of conservation education by the National Wildlife Federation (1212 Sixteenth St., N.W., Washington, D. C.) made its first appearance January 15, 1941. It has appeared monthly since that time; no subscription price has been announced.

As a special supplement to its Quarterly Report, the Colorado Game and Fish Commission (Denver) has published a 13-page mimeographed leaflet entitled "A New Method for Computing Range Capacity for Herbivorous Big Game Animals and Correlation of Range Use between Domestic Livestock Use and Game Use." It recounts the history of the deer-elk survey and the difficulties experienced with existing systems of range appraisal, and discusses a weight of food per acre method that is being tested. The food requirements per day of a deer, cow, horse, and sheep are estimated and a formula given for computing carrying capacity of range. This preliminary account of the method has been issued so that others may try it. Further report in more permanent form is contemplated.

Mimeographed copies of the papers given at the 1940 New England Game Conference can be had from the Massachusetts Fish and Game Association (20 Spruce St., Boston. 25 cents for a set of 33). Those coming within the scope of WILDLIFE REVIEW are listed and briefly annotated below.

Seamans, Roger A. "A brief description of Vermont's Pittman-Robertson projects," 5 pp.

Mostly advance discussion of a study in fluctuations of game populations, and preliminary report on a survey of deer weights and measurements.

Aldous, Clarence M., and Howard L. Mendall. "Woodcock and weather," 5 pp.

Notes on probably the most unfavorable twelve months of weather the woodcock has had to endure. The results will not be fully known until the breeding censuses of 1941 are made.

Edminster, F. C. "Soil conservation districts. A medium for practical wildlife management and landowner-sportsman cooperation," 6 pp.

About the same material as abstracted in WILDLIFE REVIEW, No. 27, May 1940, p. 25.

Bishop, James S. "Pittman-Robertson projects under way in Connecticut," 2 pp.

Plans for a sanctuary development project and for a study of the effect of forest management practices upon ruffed grouse.

Miller, J. Paul. "Administration of the Pittman-Robertson Act," 3 pp.

Cooperation by the States; make-up and functions of the staff for administering the act; nature of acceptable projects; ineligible States; record in the northeast.

Whaley, Chester T. "Federal aid in Rhode Island," 3 pp.
Report of progress on game management on a typical abandoned farm. Surprisingly, the predator problem proved of major importance.

Gashwiler, Jay S. "Waterfowl research in Maine under the Pittman-Robertson Act," 2 pp. (our copy incomplete)
One season's results of a habitat survey summarizing the findings as to aquatic plant resources and upon the nesting results for 143 broods of wild ducks.

Marsh, Joel W. "Research development, duck food and cover planting in the State of Maine, 1939-40," 5 pp.
Notes on quantities of material and methods used in both spring and fall planting of aquatic species; also on collecting various parts for propagation, and the cost.

Gould, Ernest W. "The New Hampshire Pittman-Robertson program," 3 pp.
Preliminary statements on studies of pheasants and ruffed grouse.

Howland, Kenneth C. "Education in American conservation," 6 pp.
The success of conservation depends upon thorough education of the people as to its needs, aims, and importance. Various media for publicizing conservation are mentioned and of all of them the author has most faith in the public school system. Opinions in support of this position are quoted, the present state of conservation education in the schools is outlined, and suggestions made for progress.

Hagar, J. A. "Pittman-Robertson development in Massachusetts," 3 pp.
Report of progress on studies in the restoration of black ducks and Canada geese, on experimental management of woodland sanctuaries, and upon a farm-game research project.

Adams, W. C. "Pittman-Robertson program in New York State," 3 pp.
Outline of projects, four of which are classed as research, two as acquisition and construction, and two as management.

Miller, J. Paul. "The relationship of the Federal Aid in Wildlife Restoration projects to the colleges in the northeast," 2 pp.
Opportunities of the colleges in training wildlife specialists and of employment for the latter in the restoration program.

Williamson, Leslie A. "Regulated private shooting preserves in Connecticut," 5 pp.
The same article as abstracted on pp. 32-33 of this issue of WILDLIFE REVIEW.

MacNamara, L. G. "Deer damage and management in the pine region of New Jersey," 6 pp.
Having been extirpated, deer were re-introduced as early as 1904; an open season beginning in 1909 has yielded steadily larger bags up to some 2,300 head in recent years. The principal problem connected with the animals

is damage to farm crops. The average farm is a clearing surrounded by woodland--conditions making damage almost certain. Complaints have been on the increase and in 1939 were carefully investigated. The findings are tabulated. Results of tests of repellents, flash guns, electrified and other fences, in control are reported--none were very satisfactory. Feed patches as a counter-attractant to crops show promise.

Morton, G. H. "Outline of deer investigation in New York and the northeast," 3 pp.

Plans of this investigation as an illustration of the manner in which research projects are organized in New York.

Seamans, Roger A. "Special phases of life history of deer in Vermont," 3 pp.

History of deer in the State since restocking was begun in 1878. In 1939 the total known kill was 3,159. Damage to crops is regular and is reimbursed by the State to the extent of about $3,000 annually. Electrified fences have proved both successful and unsuccessful in reducing depredations. Notes are given on tests of repellents, of which kerosene flares were most effective.

Gould, Ernest M. "Pheasant studies in southern New Hampshire," 4 pp.

Analysis of predation; the fox was most destructive and most kills were made in roosting cover. Cover types and territoriality are discussed. Of 131 eggs recorded, 79 hatched; the mortality of chicks was 82 percent. The causes of loss are detailed. The nature, scope, and results of cover and food patch plantings are summarized. The average cost of producing 100 pounds of seed was $3.38. Despite the plantings, feeding was necessary after the middle of January.

AUTHOR INDEX FOR THIS ISSUE

	Page		Page
Adams, W. C.	43	Bishop, James S.	42
Aldous, Clarence M.	42	Bourn, Warren S.	9
Aldous, Shaler E.	18	Brewer, E. G.	8
Allen, Arthur A.	15	Bump, Gardiner	20
Anderson, Ellen L.	2	Burr, J. G.	29
Anderson, Harry G.	27	Cammerer, Arno B.	40
Anderson, I. V.	34	Carlson, C. Edward	32
Ashbrook, Frank G.	16	Carpenter, Cliff D.	6
Barton, Lela V.	35	Cartwright, B. W.	37
Bathurst, Effie G.	2, 13	Chalk, John D.	29
Beaudette, F. R.	8	Chitty, Dennis	5
Bellrose, Frank C., Jr.	28	Clapham, Phyllis A.	7
Bennett, Logan J.	3, 19	Cook, Katherine M.	13
Bennitt, Rudolf	11, 15, 18	Cooke, May T.	19
Beule, John D.	23	Cottam, Clarence	8

	Page
Cowan, Ian McTaggart	2
Cox, W. T.	21
Craighead, Frank	24
Craighead, John	24
Dambach, Charles A.	11
Day, Albert M.	34
De Nio, Reginald M.	8
DuMont, Philip A.	24
Edminster, Frank C.	29, 42
English, P. F.	19
Fox, Adrian C.	3, 37
Fried, Louis A.	7
Frison, Theodore H.	39
Gabrielson, Ira N.	3, 14, 40
Gashwiler, Jay S.	43
Gerstell, Richard	21
Gilfillan, Merrill C.	35
Gould, Ernest W.	43, 44
Griffith, Richard E.	28
Hagar, J. A.	43
Haines, Francis D.	22
Hamilton, W. J., Jr.	19, 27
Hammond, Merrill C.	38
Hardy, J. I.	39
Hardy, Ross	27
Harris, Harry	22
Hartley, Wm. H.	15
Hasol, A. A.	12
Hatfield, Donald M.	5
Hawkins, Arthur S.	28
Hendrickson, George O.	22
Hewitt, Rodginal	7
Hicks, Lawrence E.	20
Holmes, Arthur D.	16
Hopkins, Frank	37
Howland, Kenneth C.	43
Hubbs, Carl L.	38
Ickes, Harold L.	40
Isaac, Robert	16
Jackson, Charles E.	41
Johnson, J. A.	17
Johnson, M. W.	40
Kalmbach, E. R.	4
Kellogg, Charles E.	16
Knappen, Phoebe	19
Koch, Karl	39
Krummes, William T.	32
Kubichek, W. F.	35
LaRivers, Ira	17
Lilly, John H.	5
Lindeborg, Robert G.	11
MacNamara, L. G.	43
Maissurow, D. K.	10
Marsh, Joel W.	43
McAtee, W. L.	9
McDowell, Robert D.	18
Mendall, Howard L.	42
Middleton, A. D.	5
Miller, J. Paul	29, 30, 42, 43
Morton, G. H.	44
Murie, Olaus J.	19
Neff, Johnson A.	4, 16
Nelson, Urban C.	6
Nicholson, Arnold J.	25, 29, 30
Olson, Herman	31
Palmer, E. Laurence	14
Palmer, L. J.	41
Parker, Lansing A.	36
Patton, C. P.	28
Pechanec, Joseph F.	12
Pirnie, Miles D.	34
Pitelka, Frank A.	9
Plitt, Thora M.	39
Pough, Richard H.	4
Powell, Burwell B.	30
Ramaley, Francis	4
Randall, Pierce E.	25
Rasmussen, D. I.	9, 29
Reed, Colin McF.	29
Renner, George T.	15
Reynolds, Florence E.	13
Rinkel, G. L.	24
Rouse, Charles H.	17
Ruhl, H. D.	20
Rutherford, R. M.	41
Rutledge, R. H.	41
Scheffer, Victor B.	25
Schroeder, Chas. R.	39
Seaman, Ellwood A.	32
Seamans, Roger A.	42, 44
Shaw, A. C.	21
Shelford, V. E.	3, 38
Sooter, C. A.	31
Southern, H. N.	26
Swanson, Gustav	6
Swift, Lloyd W.	21, 33
Tanner, James T.	27
Taylor, Walter P.	10

	Page
Terrill, Harold V.	11
Tripp, Francis	16
Twomey, A. C.	36
Van Cleave, Harley J.	6
Van Dersal, Wm. R.	36
Wade, Douglas E.	17
West, Raymond M.	8, 34
Whaley, Chester T.	43
Williams, C. S.	31
Williams, J. Fred	22
Williamson, Leslie A.	32, 43
Wilson, C. C.	16
Wirth, Conrad L.	41
Woodbury, A. M.	27
Yeager, Lee E.	37
Zimmerman, F. R.	23